HONOLULU
LA JOLLA
MONTEREY
TIBURON

SOUTHWEST FISHERIES CENTER

MONTHLY REPORT - OCTOBER 1978

RESEARCH HIGHLIGHTS

	Page
Relationship Between Fish Density and Hydrostatic Equilibrium Studied	2
Economic Studies of Fisheries in the Pacific Continue	4
Scientists Attend CalCOFI Conference	9
Oxygen Uptake of Anchovy Eggs and Larvae Modelled	13
Paper on Population Assessment Methods Completed.	15
Biological Sampling of Foreign Imports of Atlantic Tunas Continues in Puerto Rico.	20
Tuna Vessel Participation in FAX Advisory Program	21
Two Records Recoveries Made of Tagged Billfish off Southern California.	21
Seasonal Depletion of Prey Resources Monitored.	22
Fishing Begins on Rock Crab and Shortbelly Rockfish	23
Bioenergetics of Striped Bass Development Analysed.	25
La Jolla Laboratory Holds Open House.	27

NOAA/NMFS

TO OUR READERS:

In the future, to cancel delivery of the Southwest Fisheries Center (SWFC) Monthly Report, or to change the delivery address, please notify by writing: Editor, Southwest Fisheries Center, P.O. Box 271, La Jolla, California 92038.

Izadore Barrett, Director, SWFC
John F. Carr, Deputy Director, SWFC

SOUTHWEST FISHERIES CENTER
LA JOLLA, CALIFORNIA

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY
PACIFIC ENVIRONMENTAL GROUP

MONTHLY REPORT - OCTOBER 1978

STATUS OF PUBLICATIONS

Approved by Center Director

Hunter, J. Roe. Incidence of spawning at sea and fecundity in the mulitple spawning fish, Engraulis mordax. For publication in the Fishery Bulletin, U.S.

Perrin, W.F., P.A. Sloan, and J.R. Henderson. Taxonomic status of the "southwestern" stocks of spinner dolphin, Stenella longirostris, and spotted dolphin, S. attenuata. For publication in International Whaling Commission Scientific Committee Reports.

Brill, Richard W., and Andrew E. Dizon. The effect of temperature on isotonic twitch of white muscle and predicted maximum swimming speed of skipjack tuna, Katsuwonus pelamis. For publication in Environmental Biology of Fishes.

Published

Ahlstrom, Elbert H. and H. Geoffrey Moser. 1976. Eggs and larvae of fishes and their role in systematic investigations in fisheries. Rev. Trav. Inst. Peches marit., 40 (3 et 4): 379-398.

Uchida, Richard N. 1978. The fish resources of the western central Pacific islands. FAO Fish. Circ. 712, 53 p.

This report does not constitute publication and is for information only.

FISH-ENVIRONMENT INVESTIGATION

Relationship Between Fish Density and Hydrostatic Equilibrium Studied

Dr. Andrew Dizon, Leader of the Experimental Ecology of Tunas Task at Honolulu, and Martina Queenth, Research Assistant, report that work was started on an experiment to investigate the relationship between fish density and the minimum swim speed required to maintain hydrostatic equilibrium. Theoretical relationships between density and minimum hydrostatic speed have been determined (Magnuson, John J. 1973. Comparative study of adaptations for continuous swimming and hydrostatic equilibrium of scombroid and xiphoid fishes. Fish. Bull., U.S. 71:337-356) but these results have never been experimentally verified. In the experimental procedure, Dizon and Queenth used tungsten weights to vary fish density. Tungsten was chosen because it is high in density (19.3 g/cc), relatively inexpensive, and one of the least reactive of metals (to resist the acid environment in the stomach). The weights were forcefed to skipjack tuna prior to monitoring swim speed for 72 hours.

To date, five fish have been tested including two fish which served as controls (Table 1). The control fish were handled identically to the weighted fish with the exception that no weights were inserted into the stomach. The other three fish were weighted with 85, 183, and 244 g tungsten rods which increased their density 6.8%, 12.6%, and 20.3%, respectively. Table 1 also provides a first-cut estimate of the sustainable swim speeds.

Table 1

Fish length (cm)	Fish weight (g)	Tungsten weight (g)	Observed speed (cm/s)			Theoretical min. speed (cm/s)	Percent change
			No. of observations	$\bar{X}$	SD		
46.5	1,730	0	245	55.29	5.49	71.2	-22
42.5	1,381	0	250	59.26	6.23	70.4	-16
42.8	1,253	85	232	75.54	7.18	66.5	+13
43.7	1,450	183	318	91.60	5.22	69.9	+31
42.8	1,197	244	11	109.00	3.92	65.1	+67

Using Magnuson's methods, minimum hydrostatic speeds have also been calculated for each fish. Theoretical swim speeds of the control fish were about 20% above those observed. Nevertheless, it is clear that density is directly proportional to swim speed. The results show that a density increase of only 20.3% produces at least a swim speed increase of 67% over the speed predicted as the minimum hydrostatic equilibrium speed.

Work Continues on Burnt Tuna Project

Dr. Jean Cramer, contractor on the burnt tuna project, stated that the primary goal of the study is to determine whether the burnt condition is a result of primarily physiological stress before death or to handling procedures after death. In order to ascertain this, blood and tissue samples have been collected from 18 fish: 1) immediately after capture, 2) 4-10 h after capture, and 3) about 36 h after capture. Fish ranged in size from 2 to 115 kg and included yellowfin, skipjack, and bigeye tunas. Conditions of the fish ranged from normal to badly "burnt." Badly burnt fish command a fraction of their potential market value.

The blood and tissue samples will be analyzed for levels of lactic acid, glucose, CPK, and free amino acids. Histological preparations will be made of selected tissues to determine if structural differences are apparent between normal and burnt samples. Experienced fish buyers claim that the flesh of burnt tuna is mushy. Cramer hopes to determine when biochemical and structural changes occur in normal fish to produce the burnt condition.

RESOURCE ASSESSMENT AND DEVELOPMENT INVESTIGATIONS

Data Summarized for Preliminary Look at Possible Ecosystem Modeling Approach to Northwestern Hawaiian Islands Study

At a meeting held at the Honolulu Laboratory in September, Dr. Taivo Laevastu, Northwest and Alaska Fisheries Center, led a discussion on the use of an ecosystem modeling approach to the cooperative study of the Northwestern Hawaiian Islands (NWHI). To determine the feasibility of this approach, it was decided at the meeting that a preliminary examination of the available data was needed. For this Richard Uchida, Leader of the Insular Resources Task at the Honolulu Laboratory, computed density estimates of snappers, groupers, carangids, tunas, and tunalike fishes caught around Laysan Island, where most of Honolulu Laboratory's work in the NWHI has been done to date.

Work Continues on NWHI Study

Personnel in the Insular Resources Task continued work processing data and doing other tasks related to the NWHI study. Research Assistant Robert Moffitt coded data from Townsend Cromwell cruise 78-02 for key-punching, identified fish specimens collected in trawl hauls on the Northwest Hancock Seamount, and coded the backlog of trolling data collected over several NWHI cruises.

Research Assistant Paul Shiota sorted and volumized plankton samples and, assisted by Research Assistants Bert Kikkawa and Darryl Tagami, fabricated Witham larval lobster collectors that will be used in an effort to collect spiny lobster larvae in the NWHI. James Uchiyama, Fishery Biologist, computed estimates of spiny lobster and slipper lobster density around Laysan Island.

Research Assistants Jeff Sampaga and Jose Enitan read otoliths of pink snapper, Pristipomoides filamentosus, and pelagic armorhead, Pentaceros richardsoni. The counts of daily growth marks for the armorhead were 630 for a 23.8 cm (SL) fish and 620 for a 25.2 cm (SL) fish.

Uchiyama completed the press release, cruise report, and narrative report for Townsend Cromwell cruise 78-03 and Research Assistant Roy Sasaki analyzed 100 fish flesh samples collected around Guam and the Northern Mariana Islands for ciguatoxin using the radio-immunoassay method.

The Townsend Cromwell departed Honolulu October 16 on cruise 78-04 (TC-81) to assess the demersal and pelagic resources of the NWHI. Members of the scientific field party are Chief Scientist Reginald Gooding and Research Assistants Victor Honda, Robert Humphreys, Bert Kikkawa, and Darryl Tagami.

Status Reports on Fish and Fisheries Completed

In response to a request from Washington, D.C., Uchida completed status reports on fish and fisheries in Western Samoa and Tonga.

Economic Studies of Fisheries in the Pacific Continue

Dr. Michael Adams, Industry Economist, assisted by Linda Hudgins, Economist, Gary Kamer, Statistician, and James Cooper, Research Assistant, continued economic studies in a number of short- and long-range projects. These projects included studies on the spiny lobster industry, recreational fishing fleets, charter boat customers, Hawaii and American Samoa billfish-tuna industries, supply of numerous fishery products in Hawaii originating from foreign countries and the mainland United States, and collection of demographic statistics.

The economic sections of the lobster fishery management plan (FMP) were updated and rewritten to reflect the entry of new firms into the fishery. A revision of the administrative report on the economic feasibility of lobster fishing in the Northwestern Hawaiian Islands was begun.

For the billfish FMP, information on the Hawaii charter boat industry was updated. Also, a first data collection effort was completed in American Samoa for the foreign longline fleets, fish brokers, dory fleet, canneries, and marketing of domestically consumed fishery products. Preliminary reports are in preparation from this new information.

A long-range study was initiated in an effort to understand the economic distribution of imported and domestically produced fish products of the Hawaii tuna cannery and the fresh fish market. Monthly information on prices and quantities of various imported fish products for the last nine years have been collected. The same information is being collected from the U.S. Army Corps of Engineers on interstate shipments from the mainland United States. The State of Hawaii's Bureau of Labor and Industrial Relations is cooperating by furnishing relevant wage rates and the State's Energy Office is providing important information on factor inputs for raw and processed fish production.

On a broader front, economic analysis is being conducted of wholesale and retail activities for various fish products in Hawaii. No such studies are available for the consumer sector of Hawaii's fish economy. Most studies for public policy analysis have emphasized the production sectors, but consumers and the services of middlemen make up just as important a part of Hawaii's fish economy.

Though wholesalers, retailers, and consumers are not of primary concern in much of economic fishery research, the measure of success of the Fishery Conservation and Management Act of 1976 and various fishery development projects may likely depend on the long-range impacts to these final user groups. With these long-range perspectives in mind, a part of the economic research at the Honolulu Laboratory is devoted to the consumer side of the fish products industries. Important prices and price indexes have been collected on a monthly basis from the U.S. Department of Labor and the U.S. Census Bureau. Raw data were also obtained from the Hawaii Department of Health from a monthly survey on fish consumption. Preliminary results from the import studies already suggest that per-capita consumption of fish products in Hawaii is considerably greater than the national average.

To improve the economic understanding of final user groups, a contract was let by the Honolulu Laboratory to collect monthly price and quantity information from wholesale and retail firms in Hawaii. When the survey begins in 1979, information will be collected for 12 months from importers, fish dealers, auctions, processors, cooperatives, retail stores, and hotels. The results of this survey will be combined with the State of Hawaii survey, the import and interstate data, and the

U.S. Department of Agriculture Nationwide Food Consumption Survey, in an effort to begin to understand the economic importance of seafood products in Hawaii. These studies will contribute to the long-range evaluation of fishery management and fishery development policies.

The Honolulu Laboratory has been asked to contribute to five national economic surveys and data management contracts: 1) NMFS national fish consumption survey to include Hawaii, being conducted by the NMFS Fiheries Development; 2) NMFS national contract to collect recreational fishery data which will include some sparse economic information; 3) NMFS Southeast Fisheries Center, national contract for economic data collection system for commercial fisheries; 4) NMFS Northwest Fisheries Center, national contract for economic data collection system for recreational fisheries; 5) Western Pacific Regional Fishery Management Council, Hawaii survey of recreational fisheries.

Application of Markov Decision Processes to Fishery Management Studied

Dr. Roy Mendelssohn, Operations Research Analyst, assisted by Debra Chow, Computer Programmer, has been analyzing numerical results from a variety of models in salmon fishery management as examples in studying the application of Markov decision processes of fishery management.

Several key questions are being examined. The first is the effect of grid choice and of the method of making the problem discrete on the final solution. These have been found to be critical factors in post-optimality analysis.

Secondly, techniques to "smooth out" the fluctuations in the allowed year-to-year catch have been explored. The computational results confirm earlier analytic results on the qualitative properties of an optimal management scheme. They show how the "best" management scheme varies as the relative price of fish to the cost of the fluctuations vary. This is essentially a multiobjective technique looking at the tradeoff between the mean per period catch and the variance of the catch per period. It allows the decisionmakers to see explicitly the relative value they are giving to each of the two objectives.

Research into adaptive or Bayesian control procedures has also progressed. Initial exploration of approximation methods for these techniques suggest for the salmon models that if 30-40 years of data are available, little is gained by using these more complex techniques as compared to simpler approximations which are available.

Programs are presently being coded to examine the tradeoff between longtime expected economic gain versus the risk of undesirable events. These results will be used to revise an administrative report on the same subject. Also, programming is underway to find optimal management

measures when the cost of research is included in the problem. This will make it possible to help decide how often expensive research cruises should be made in order to make more precise estimates of standing biomass, as compared to less precise and less costly alternative methods of forecasting.

Background Document Prepared on West Central Pacific Island Fisheries

Howard Yoshida, Fishery Biologist, in cooperation with Wilvan Van Campen, Executive Director, Western Pacific Regional Fishery Management Council (WPRFMC) prepared a background document of the status of fisheries of the western central Pacific islands in the U.S. fishery conservation zone. This document was part of the material taken to Kailua-Kona by Director Richard Shomura for the meetings of the WPRFMC, the Council Chairmen, and the Marine Advisory Fisheries Committee (MAFAC).

Estimated Skipjack Tuna Landings Continue Below Long-Term Average

The October 1978 Hawaii landings of skipjack tuna were estimated at 161 metric tons (MT), which is 2 MT above the landings for the same period in 1977 and 115 MT below the 1948-77 long-term average for the same period. The cumulative landings from January through October were estimated at 2,617 MT, which is 633 MT below last year's landings for the same period and 1,404 MT below the 1948-77 long-term average for the same period.

Townsend Cromwell Debriefing Held in Honolulu

Dr. Robert Skillman, Vessel Committee Chairman, reported that a year-end, debriefing meeting for the Townsend Cromwell was held on October 3 in the conference room. In attendance were Richard Shomura, Director, Honolulu Laboratory, and other Laboratory staff members, R. Adm. Eugene A. Taylor, and C. R. Hitz from the Pacific Marine Center, Commander Edward Gelb, and other NOAA Corps officers from the Townsend Cromwell.

Fishery Statistics System Being Prepared

The need for accurate fishery statistics and information systems for the Central and Western Pacific area has been apparent owing to the increased emphasis on the assessment of commercial and recreational fisheries. In this regard the Honolulu Laboratory has contracted with the Living Marine Resources, Inc. (LMR) to investigate the fishery statistics systems in Hawaii, American Samoa, Guam, and the Northern Mariana Islands. The final draft of LMR's report on phase 1 of the

contract has been submitted to the Honolulu Laboratory and to other agencies for review and critique. This report specified the statistics and information needs of the WPRFMC, NMFS, State of Hawaii, American Samoa, Guam, and the Northern Mariana Islands and evaluate how well these needs are now being satisfied by existing data collecting procedures. The contractor will now proceed to the second phase of the study which involves the development of alternative data collecting schemes in order to meet the unsatisfied needs specified in phase 1.

Northwestern Hawaiian Islands Study Participants Meet

The monthly meeting of the NWHI Tripartite Cooperative Study was convened by Dr. Robert Skillman on October 12 at the Honolulu Laboratory. The purpose of the meeting was to discuss data management systems for the data generated by the participating scientists. The consensus was that each agency should have a data management system so that data will be collected in computer-usable form and be made available and transferable among systems. Two data management systems were presented: 1) the Fishery Information System, Honolulu Insular Resources (FISHIR) and 2) the Hawaii Coastal Zone Data Bank. FISHIR is the data base management system now being used by Honolulu Laboratory to manage all data generated by the Insular Ecosystem Study in the NWHI. The Hawaii Coastal Zone Data Bank is used by the Hawaii Division of Fish and Game and various elements of the University of Hawaii Sea Grant Program. Since so many of the studies are closely related, the participants decided to form a group to work on common data collection formats as well as on the sharing of data management systems whenever possible.

Hawaiian Monk Seal Meeting Held in Seattle

The Marine Mammal Commission assembled an ad hoc group, of which Dr. R. Skillman of the Honolulu Laboratory was a member, to formulate a comprehensive research proposal on the Hawaiian monk seal at the offices of the Marine Mammal Division, Northwest and Alaska Fisheries Center, on October 18-19. The discussions centered on determining means of improving the accuracy of the annual surveys conducted from vessels, investigating causes of pup mortality. The group discussed improving the surveys by studying behavior and activity patterns of the monk seal as well as inter-island movement. Studies of habitat requirements through surveys of pupping haul-out sites and habitat use patterns (e.g., feeding) were discussed. The discussions on pup mortality centered on an experimental shark abatement program and on captive maintenance and study of pups from the wild.

Data Processing Group Involved in Several Major Activities

George Liao, Operations Research Analyst, reported that the Automatic Data Processing (ADP) group carried over into the new fiscal year a major project concerned with converting data from the United Fishing Agency (UFA) into a machine-sensible medium. These data represent nearly 20 years of daily fish auction sales on Oahu.

To accelerate processing, Cathy McNamara, Data Transcriber, was recently hired, joining full-time temporary Data Transcriber Barbara Jacques. Lucille Tsukano, Computer Technician, has been serving as the lead analyst on this project, documenting codes on fish buyers and vessels and local names for various fish species, resolving problems with auctioneering jargon, and deciphering illegible records.

In connection with the NWHI Study, a cooperative project involving member agencies of the Tripartite Agreement (U.S. Fish and Wildlife Service, Hawaii Division of Fish and Game, University of Hawaii Sea Grant and the Honolulu Laboratory), the ADP group is working towards developing a comprehensive species name and code list. The list will contain the scientific, common, and local names of expected species and the corresponding codes used by the member agencies.

Work on establishing a detailed inventory of data files is progressing. This work will result in a data dictionary and directory for the Honolulu Laboratory whereby definitions of codes, data medium type, and geographical and chronological coverage will be stored as reference data. Sally Kuba, Computer Programmer, is the lead analyst in this new activity.

Another major activity of the Automatic Data Processing group concerns the Foreign Vessel Observer Program. The position description for observers has been written and being reviewed by the Personnel Division of NASO. Ray Sumida, Research Assistant, is devoting much of his time to drafting a field manual for this program and outlining a month-long training course for the four new hires expected to begin around the first of the calendar year.

LA JOLLA LABORATORY

Coastal Fisheries Resources Division

Scientists Attend CalCOFI Conference

More than 150 scientists from 17 different institutions attended the 1978 conference sponsored by the California Cooperative Oceanic Fisheries Investigation (CalCOFI) and coordinated by Dr. Reuben Lasker of the La Jolla Laboratory, held in Idyllwild, California, October 31 to November 2.

CalCOFI is a large-scale cooperative study of the oceanography and fisheries of the California coast by the National Marine Fisheries Service, Scripps Institution of Oceanography, and the California Department of Fish and Game. CalCOFI gathers data from the Pacific Ocean,

extending out to the 200-mile limit of the U.S. contiguous fishery zone from San Francisco to Baja California. The CalCOFI conference is intended to inform all interested scientists of current ocean research in this area.

The 1978 CalCOFI conference featured a symposium on the non-consumable living resources of the California Current, their interactions with consumable resources, and their exploitation. The symposium was organized by Alec D. MacCall, Marine Biologist with the California Department of Fish and Game, who is stationed at the SWFC, La Jolla Laboratory.

John L. Butler, Fishery Biologist at the La Jolla Laboratory, and George L. Hunt Jr., of the University of California at Irvine, participated in the symposium, presenting a paper that related the reproductive success and time of breeding in Western Gulls and Xantus' Murrelets to the availability of food in the Southern California Bight. Butler and Hunt noted that the murrelet, which feeds primarily on larval anchovy and larval rockfish, produced eggs one month later than its normal time during 1978, a year when anchovies were apparently very scarce.

Other papers presented at the symposium related zooplankton community structure to larval fish ecology, described the ecological roles of non-commercial fishes, detailed the impact of certain marine mammals on California's fisheries, and reviewed the relationships between bird populations and fishery resources.

Papers Contributed to CalCOFI Conference

Many researchers from SWFC's La Jolla Laboratory contributed papers to the conference, as follows:

L.E. Eber, Oceanographer, presented a paper describing his work with Oceanographers Ron Lynn and Ken Bliss on the preparation of a set of vertical sections to 500 meters, depicting seasonal distributions of temperature, salinity, oxygen, and density along each of the CalCOFI cardinal lines from line 60 off San Francisco to line 130 near the tip of Baja, California. Sections will also be prepared to describe conditions along selected lines parallel to the coast and thereby depict the mean changes in the distribution of physical properties along the course of the California Current.

R. Lynn presented an overview of marine conditions in the CalCOFI region during 1977-78. (Details on work by Lynn and McConaghy are given later in this report). Lt. David C. McConaghy, NOAA Corps Officer, working with Dr. M. Laurs of the La Jolla Laboratory, reported improvements in programs for the quantitative analysis of very high resolution radiometer data from NOAA polar orbiting satellites to measure sea surface temperatures.

Roger Hewitt, NOAA Corps Officer working with Dr. P. Smith at the La Jolla Laboratory, proposed a hypothesis suggesting that the "patchy" character of pelagic larval fish distributions is adaptive, a life history trait that co-evolved with a suite of traits which together assure optimum larval survival.

James Thrailkill, Rich Charter, and Dr. Paul Smith of the Survey Systems Development and Evaluation Program at La Jolla presented a paper comparing the catch of the bridled one-meter ring CalCOFI net with the standard CalCOFI bongo net. The bongo net retains small fish larvae and soft plankton as effectively as the one-meter net, but also captures more large fish and motile plankton. This is a result of the lack of a bridle in front of the bongo net.

Dr. Gary Stauffer, Fishery Biologist, and Keith Parker, Statistician, of the Commercial and Recreational Fisheries Research and Development Program, estimated the 1978 spawning biomass for the central subpopulation of northern anchovies. Their estimate, based on larvae abundance as measured by four egg- and-larva surveys conducted over the period from January to June 1978, was 1,304,000 short tons. Based on the Pacific Council's anchovy plan, optimum yield for the central subpopulation during the 1978-79 season is 101,333 short tons.

Dr. E.H. Ahlstrom, Senior Scientist for the Coastal Fisheries Resources Division, with Dr. H.G. Moser and E. Sandknop of the Multispecies Taxonomy Program, announced that their distributional atlas of rockfish (Sebastes spp.) larvae in the California Current region for the years 1950 to 1975 is soon to be issued. Larvae of Sebastes spp. are among the more common taken on CalCOFI cruises, usually exceeded in quantity only by the larvae of northern anchovy and Pacific hake.

Richard Methot, a graduate student at Scripps Institution of Oceanography who is working with Dr. Hunter at the La Jolla Laboratory, presented a paper describing an analysis of the size of daily growth increments in the otoliths of larval northern anchovy. An interesting result was that larval anchovy growth in the sea seems to be as fast as the fastest growth seen in the laboratory.

Fishery Biologist Gail H. Theilacker presented a paper describing her work with the preservation shrinkage of larval anchovy. Her results suggest that morphological differences that have been reported to exist between laboratory-reared and sea-caught larvae of the same length may be the result of the methods of handling larvae prior to preservation.

Dr. John Hunter, leader of the Larval Fishes, Coastal East Pacific Program, presented a paper with Stephen Goldberg of Whittier College, describing a method for directly determining the frequency of spawning of a multiple spawning pelagic fish population. From examination of the post-ovulatory follicles of laboratory-spawned anchovy, Hunter and

Goldberg developed criteria for determining how long ago a fish had spawned. From these criteria, Hunter estimated the frequency of spawning of the northern anchovy population.

Dr. Paul E. Smith, leader of the Survey Systems Development and Evaluation Group, and D. Van Holliday of Tracor Inc. presented a paper describing the information gained on four cruises conducting acoustic resonance surveys. The gas bladder of a fish will resonate in response to certain sound frequencies, the resonant response can be correlated with gas bladder volume and depth. The four cruises were intended 1) to determine the minimum suite of equipment needed to conduct standard sonar mapping surveys with ancillary acoustic resonance information to estimate the proportion of schools containing fish with gas bladders and the size distribution of fish within these schools, and 2) to determine the maximum ship speed at which acoustic resonance data can be taken.

Results of the acoustic resonance work indicate that a sufficient survey using trawls, sonar-mapping, and acoustic resonance can trace cohorts of dominant bladder-bearing fishes into the fishery, and can distinguish between spawning and non-spawning sizes of fish at 25 mm intervals. Sonar-mapping surveys will have to slow from 11 knots to less than 9 knots during the acoustic resonance portion of the survey--with the speed depending on the minimum fish school size needed for a good sample, weather, and surface chop. Data reduction on board ship requires a medium-size computer; an automated system requiring no training on the part of the duty technician costs 1.3 million 1977 dollars. A subset of this equipment could be used to estimate the horizontal and vertical distribution and absolute abundance of late anchovy larvae measuring 10 to 35 mm.

Butler and Moser of the Multispecies Taxonomy Group reported that they have successfully reared larvae from wild-caught eggs of four species of croakers of the family Sciaenidae: the Queenfish, Seriphus politus, the Spotfin Croaker, Roncader stearnsii, the Black Croaker, Cheilotrema saturnum, and the California Corbina, Menticirrhus undulatus. The goal of the project has been the identification of previously unidentified eggs and larvae found in the CalCOFI collections.

Charles P. O'Connell, Fishery Biologist, described the results of his examination of 320 larvae from 64 specieal net tows taken in the Southern California Bight in March 1977. O'Connell discussed the implications for estimates of abundance and mortality of finding 25 specimens with possible symptoms of starvation.

P.A. Paloma, Fishery Biologist, presented a paper describing the development of organs associated with the digestive system in laboratory-reared larvae of Pacific mackerel, Scomber japonicus, from the day of hatching to day 14. Stepwise discriminant analysis of measurements of six organs in the digestive system of fed and starved laboratory-reared larvae indicate some organ dimensions may be a useful tool in discriminating between larvae in healthy feeding condition and starving, moribund

larvae. These criteria could be another valuable aid in estimating early mortality rates of the species population at sea.

Barbara Sumida, Biological Technician, Ahlstrom and Moser presented a paper describing eggs and larvae for six species of flatfish with heavily pigmented larvae occurring off California. The fish described were the pleuronectids: Pleuronichthys coenosus, P. decurrens, P. ritteri and P. verticalis. A brief description of the larvae of Pleuronichthys ocellatus was also given.

Dr. Reuben Lasker, leader of the Coastal Fisheries Resources Division and organizer of the conference, presented a paper on the possible adverse effect of storms through the Southern California Bight on the 1978 anchovy year class. Phytoplankton and microzooplankton needed for feeding and survival of first-feeding anchovy larvae did not have a chance to aggregate in sufficiently high densities because of turbulence in the upper mixed layer due to unusual storm activity in the Southern California Bight during the 1978 spawning season. Sufficiently calm conditions began around mid-March with evidence of stratification and aggregation of Gymnodinium splendens, a suitable food for first-feeding anchovy larvae. He predicted a poor 1978 year class for anchovies since a large portion of the anchovy spawning season seemed to be unsuitable for first feeding larvae.

LARVAL FISHES, COASTAL, EAST PACIFIC

Oxygen Uptake of Anchovy Eggs and Larvae Modelled

Dr. Daniel Weihs, Research Associate, has defined and developed a theorectical model describing the oxygen uptake of eggs and yolk-sac larvae of anchovy. The model was designed to check a suggestion by Dr. John Hunter (Fish. Bull. 70, 821, 1972) that the regular bouts of continuous swimming by yolk-sac larvae may have a respiratory function. Weihs' theoretical approach was to calculate the oxygen available to the larva when resting and the oxygen available while moving and to compare these values with the metabolic requirements of eggs and larvae. These calculations showed that at full oxygen saturation there is enough oxygen available for eggs and larvae even if they are not moving. However, when the oxygen concentration goes down to about 50% of saturation, the available oxygen is less than the metabolic requirements.

A different reason for the bouts of swimming may be to keep the negatively buoyant larvae from sinking to greater depths. An experiment has been set up to check on the predictions of the model, and data are being collected now. This experiment includes observations of larvae

kept in tanks with different dissolved oxygen levels to monitor possible changes in behavior due to oxygen depletion. Also, the attitude and mean motion of larvae are being measured to test the sinking hypothesis.

Manuscripts Completed

James Zweifel, Mathematician, and Andrew Vrooman of NMFS, Washington D.C., have completed a revision of a manuscript which describes northern anchovy subpopulations, based upon analyses of the blood serum protein transferrin, morphometrics and meristics. Zweifel has completed a revision of a manuscript on the temperature specific equations for growth and development of anchovy during embryonic and larval stages based on comments and suggestions made by in-house reviewers.

Zweifel has also completed a revision of a manuscript on allometric relationships in larval fish. Evidence presented there suggests that most relationships are dynamic rather than static even within life stages and that the equation of simple allometry can lead to serious errors in estimation and extrapolation. Based upon suggestions by in-house reviewers, Zweifel has completed a revision of a manuscript on the description of functional and statistical relationships among the means of negative binomial distributions.

Zweifel has nearly completed a manuscript for in-house review on the estimation of larval production abundance and mortality from egg and larval surveys.

ALBACORE FISHERIES

Papers Presented at CalCOFI Conference

Oceanographer Ronald Lynn and NOAA Corps Lt. David McConaghy each made a presentation at the CalCOFI Conference at Idyllwild, California. Lynn's presentation entitled, "An overview of marine environmental conditions in the CalCOFI region during 1977-78," included a review of the broad-scale aspects of the eastern North Pacific (ENP) during the winters of early 1977 and early 1978 (see the September Monthly Report for a write-up of the ENP marine conditions) and observations of local regional marine conditions made on the CalCOFI series surveys, December 1977 through April 1978. During both winters there were large, broad-scale and very persistant anomalies in the marine conditions, clearly seen in the barometric pressure field, winds, and computed Ekman transport. The 1977-78 winter coastal upwelling off the U.S. west coast was either very weak or replaced by shoreward transport of surface waters. Drought conditions which prevailed in the earlier winter were reversed by near-record rainfall. The precipitation lowered salinities generally to record values in the California Current (based upon CalCOFI records). The progression of increasing by negative salinity anomalies is seen in the

CalCOFI station data from the December survey through the April survey. The geostrophic current field revealed the southern California eddy and the countercurrent to be well developed from December through March. A large area of onshore flow existed off southern California. The observed distribution of anchovy larvae gave evidence that onshore transport aided in preventing early dispersal of anchovy spawn.

Lt. McConaghy's presentation was entitled,"Satellite derived sea surface temperatures: a review of recent developments." Significant improvements have been made in programs for the quantitative analysis of very high resolution radiometer (VHRR) data from NOAA polar orbiting satellites to measure sea surface temperatures. When the data field includes a recognizable coastline, the mean deviation of the geographic location of the data field can be made to fall within 0.02° in latitude and 0.04° in longitude. This is accomplished by adjusting the projected satellite subtrack such that the ocean to land temperature change coincides with the known position of the coastline. Estimated sea surface temperatures derived from satellite radiometer measurements have been compared to a Coast Guard radiometer overflight survey and to CalCOFI station measurements. At the 95% confidence interval the mean deviation is +1.58°C.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Paper on Population Assessment Methods Completed

Keith Parker's paper, "Variable area transect estimation of population density" was accepted for publication by the Journal of Wildlife Management. The publication date was set for April 1979. The paper utilizes information gathered in cooperation with California Department of Fish and Game on pismo clams.

Parker has also completed a manuscript on estimating anchovy spawner biomass, from the population's spawning frequency. Excerpts from the manuscript were presented at the annual CalCOFI conference held in Idyllwild.

Spawning frequency is usually defined as the number of spawnings per unit of time, a number that is greater than or equal to one. In a multi-spawning pelagic species, the number of times an individual fish spawns may vary with age, making the above definition difficult to use. Alternatively, spawning frequency can be defined as the fraction of mature females spawning per unit of time. With this definition, it is irrelevant whether or not all ages spawn with the same frequency. Provided the time units are sequential and non-overlapping, the fractions are additive. With this alternative definition the following relationship between spawning biomass and production holds:

$$P = S \cdot a \cdot b \cdot c \qquad (1)$$

where P = production in eggs,

a = fecundity in eggs per gram of female's body weight

b = fraction of female population spawning, (weight of spawning females)/(weight of mature females),

c = (weight of females)/(weight of spawning stock), usually assumed to be 0.5

and where the time units for production, P, and fraction spawning, b, are the same.

Spawning biomass can be estimated directly:

$$S = P\,(a \cdot b \cdot c)^{-1} \qquad (2)$$

From spawning frequencies for northern anchovy estimated by Dr. John Hunter and Stephen Goldberg, spawning biomass can be calculated. The equation can be corrected for errors in the classification of females as to time of spawning by dividing b into its component estimates: 1) the observed fraction spawning, say b', and 2) the fraction correctly classified, say d. Using these estimates, b = b'/d. From equation (2), the spawning biomass is

$$S = P\,(a \cdot b' \cdot c)^{-1}\,d \qquad (3)$$

For the northern anchovy, Hunter and Goldberg estimate the observed spawning fraction, b', to be 0.16/day for the time period February 15 to 27. Hunter and Goldberg also estimate the fraction correctly classified, d, to be 1.10 and the batch fecundity to be 368 eggs/gram (or 3.34×10^8 eggs/ton). Zweifel estimates daily egg production for the time period February 15 to March 10 to be 2.32×10^{13} eggs/day. From equation (3) the estimated spawning biomass is approximately 1 million tons.

The advantage of using equation (3) in estimating spawning biomass is that all the parameters can be estimated on a real time basis and that sampling effort can be greatly reduced over the effort presently needed to obtain the CalCOFI estimate.

Work on Fishery Plans and Management Information Documents Continues

During October, work continued on the Jack Mackerel Fishery Management Plan under the leadership of Alec MacCall, Marine Biologist with the California Department of Fish and Game's Operation Research Branch stationed at the La Jolla Laboratory. Based on CalCOFI larva abundance data, the spawning biomass has not changed appreciably since 1951. MacCall

estimates the spawning biomass to be lower than previous estimates--between 1.0 and 2.0 million short tons. MacCall calculated potential yield by the "Gulland method" (not to be confused with maximum sustainable yield). For the Southern California fishery, the potential yield is estimated to be 100 to 175 thousand tons; for the entire stock, the potential yield is 140 to 235 thousand tons.

Dr. Gary Stauffer, Dr. Dan Huppert, and MacCall are preparing a joint NMFS/Department of Fish and Game Pacific bonito management information document. Rob Collins and John Radovich of the Department of Fish and Game are also participating, with Collins acting as chairman. During October, the preliminary stages were completed and objectives were agreed upon. The major part of the work will be done during two multi-day workshops scheduled in November.

A minor modification will be made to the Anchovy Fishery Management Plan to comply with NMFS Headquarters' comments about the method of specifying domestic harvest capacity. The Council has agreed to consider the change at its December meeting in Portland.

Optimum Yield Estimated for Pacific Hake

Dr. Gary Stauffer, Fishery Biologist, attended the Pacific hake optimum yield workshop in Seattle, October 4-6. Data and procedures for estimating optimum yield were reviewed and an estimate of about 200,000 metric tons for 1979 was agreed upon. The domestic fishery will probably take 50,000 metric tons, leaving a 20% biological reserve. The reserve and any excess in the estimated domestic catch will be released for foreign harvesting after a mid-year evaluation of the stocks.

Rockfish Samples Examined

John MacGregor, Fishery Biologist, spent most of the month in routine examination of rockfish scales and otoliths with emphasis on the blue rockfish samples. Preparation were made for a 3-day rockfish sampling cruise in December. During that cruise, the deeper offshore areas will be sampled.

Economic Studies of California Fisheries Continue

Jane McMillan, Industry Economist, and Dan Huppert, leader of the Commercial and Recreational Fisheries Research for Management Group at La Jolla, completed the economics section of the first draft of the Jack Mackerel Fishery Management Plan, incorporating comments from the Advisory Subpanel. One of the important aspects of the fishing fleet is its ability to harvest several different pelagic species. This is evidenced in the draft plan by tables showing the quantities caught of several species, the level of participation by the fleet in the several species harvests, and the proportion of total state landings of each species accounted for by jack mackerel fishing vessels. McMillan worked

out these tables with the assistance and data-sharing of the California Department of Fish and Game personnel in Long Beach. Similar analyses for bonito fishing vessels will be done next month. Analysis of the bonito fishing fleet is complicated by the involvement of high seas tuna vessels as well as local Southern Californian vessels.

McMillan has now compiled an impressive quantity of socio-demographic information covering California fishing communities and coastal counties. Most of the data derives from census records and Chamber of Commerce data collections. A full report on her findings will be prepared in the coming weeks.

McMillan has learned to use the NMFS data base system FISHSTATS, which is now on line and accessible by authorized NMFS employees. The system contains all basic data collected in the annual processed products survey. The data file is secured by special access codes, but summary information created from the confidential data can be produced readily and published by researchers. With the system, McMillan has produced summaries by species/product/area for anchovies, mackerel, and bonito.

SURVEY SYSTEMS DEVELOPMENT AND EVALUATION GROUP

Paper Presented at the 96th Joint Meeting of the Acoustical Society

Dr. Paul E. Smith, leader of the Survey Systems Development and Evaluation Group at La Jolla, was an invited participant at the 96th Meeting of the Acoustical Society of America, a joint meeting with the Acoustical Society of Japan, held in Honolulu, November 27 - December 1. With Dr. Van Holliday of Tracor, Inc., Smith presented a paper entitled, "Seasonal changes in fish size distribution as detected by acoustic resonance survey and by conventional sampling." Dr. Smith also read a paper for R.J. Vent entitled, "Fish school target strength measurements off southern California." The data for this paper were taken aboard the R/V David Starr Jordan. Target strength estimates taken aboard the Jordan were used by Dr. Richard H. Love in a paper entitled, "A model for estimating distribution of fish school target strengths." SWFC ship-time was also involved in a paper by Dr. Van Holliday and Dr. Richard E. Pieper of the University of Southern California entitled, "Volume scattering strengths and plankton distributions at acoustic frequencies between 0.5 and 3 Megahertz." Abstracts of these and other papers are available from Dr. Smith.

In addition to the formal papers, a 4-hour workshop was held in which 20 biologists and physicists engaged in discussions of quantitative standards for biological and acoustic sampling.

Oceanic Fisheries Resources Division

MARINE MAMMAL BIOLOGY AND TECHNOLOGY PROGRAM

Improvements Made in Aging Techniques for Odontocetes

As a result of the Odontocete Aging Workshop held at the SWFC in early September, improvements have been made in the techniques used at the La Jolla Laboratory for determining the age of odontocete cetaceans by examining tooth sections. Since the workshop, Dr. Al Myrick and his staff at La Jolla have perfected a new technique which includes decalcification and staining of tooth sections and which results in a specimen that is easier to read.

Another result of the aging conference is the organization of a collection at the La Jolla Laboratory of tooth specimens from dolphins whose ages are known. In addition to the specimens, the collection will include data on the life history, veterinary records, and information on tetracycline injections given to the dolphins from which the teeth were taken. This collection will be available to all scientists investigating aging in odontocetes.

Plans Made for Salvage of Beached and Stranded Marine Mammals

Dr. W. Perrin, leader of the Marine Mammal Biology and Technology Program, reported that the Coastal Marine Mammal Program in association with the Regional Office, has begun setting up a network for salvaging stranded or beached animals. The salvage program will include necropsy and analysis of stomach contents of recovered animals.

A contract is being let to the state of California to investigate the areas of conflict between fisheries and marine mammals. Dan Miller of the California Department of Fish and Game will be the state representative in this program.

Porpoise Behavior Cruise on Regina Maris Ends

Dr. W. Stuntz, Fishery Biologist at the La Jolla Laboratory, reported that the cruise report for the porpoise behavior cruise aboard the R/V Regina Maris is nearing completion. The Regina Maris, a 3 masted barkentine, was chartered in an attempt to find a method of approaching porpoise schools close enough for behavioral observations to be made. Porpoise schools in the yellowfin purse seine fishery area normally run from engine-driven vessels. Using a sailing vessel, it was possible to approach schools and some interesting observations were obtained.

Unfortunately it proved impossible to remain with a school for extended periods of time without using the engines because of problems with wind direction and the rapid swimming speeds of porpoise schools.

Porpoise School Structure Study to Begin

A contract is being prepared to fund a study on the school structure of Hawaiian spinner dolphins. The data obtained from this study will be used in assessing the stocks of spinner dolphins and in assessing the behavioral differences between fished and unfished dolphin stocks. As a part of assessing school structure, the study is likely to provide data on school cohesiveness over time, age and sex distribution of the population under study, and an estimate of gross reproductive rate.

TUNA RESOURCES PROGRAM

Biological Sampling of Foreign Imports of Atlantic Tunas Continues in Puerto Rico

Fishery Biologist J. Renner at La Jolla reported that sampling of foreign imports of Atlantic tunas shipped through Puerto Rico during the period from January to October 1978 has been at about the same level as during the comparable period last year. A total of 89 samples has been analysed for fork length, weight, and species composition to date this year. The table below shows the breakdown by species and gear for samples of Atlantic-caught tunas that have been transshipped to Puerto Rico.

Species	Gear	No. of Samples	No. of Fish Sampled	Tonnage Sampled (MT)
Yellowfin	Baitboat	29	1520	991
	Purse Seine	6	239	170
Skipjack	Baitboat	16	801	4200
	Purse Seine	6	302	3175
	Unknown	1	50	5
Bigeye	Baitboat	24	957	453
	Purse Seine	5	181	249
Albacore	Longline	2	100	662
TOTAL		89	4150	9905

Tuna Vessel Participation in FAX Advisory Program

During October 1978, 22 tuna seiners and two research vessels contributed synoptic weather and expendable bathythermograph (XBT) data to the NMFS FAX Advisory Program. A total of 234 weather and 28 XBT observations was reported via NMFS-licensed radio station WWD. The chart below lists data pertaining to program participation during October 1975-1978. The number of reports received during October 1978 was at the highest October level since 1975.

	October			
	1975	1976	1977	1978
Number of Vessels with Equipment	75	76	71	49
Number of Vessels Reporting	33	17	22	24
Number of Weather Observations Reported	340	135	177	234
Number of XBT Observations Reported	55	5	6	28
Monthly Observation Total	395	140	183	262

Leading all program participants this month were Captain John Gomes and the crew of the tuna seiner Santa Rosa with 42 weather observations and 10 XBT observations. We thank these and all other program participants.

Two Record Recoveries Made of Tagged Billfish off Southern California

The first recoveries of tagged striped marlin off the southern California coast were made during October, one by Cheryl Husfar of San Diego and the other by Steve Nesbitt of Irvine, according to James Squire, Fishery Biologist at the La Jolla Laboratory. Squire, who is responsible for maintaining the official records of tagged billfish in the Pacific, said that previously all recoveries of striped marlin were made to the south and southwest of San Diego, off Baja and central Mexico, the Hawaiian Islands and near the Marquesas Islands in the southeast Pacific. None of the several thousand tagged marlin had ever been recovered off southern California.

Squire's records show that the striped marlin recovered by Cheryl Husfar was tagged south of Santa Barbara Island on October 12, 1977 by Richard Barrett of Newport Beach. Almost one year later, Husfar, fishing from the sport boat, High Life, skippered by Peter Groesbeck, fought the tagged marlin for one hour and fifty minutes before landing the large fish. In 1977 this same marlin was fought for fifty-four minutes by Barrett before he could tag and release the fish.

The tagged striped marlin recovered over a year from the date of tagging by Steve Nesbitt was also tagged off southern California, west of Catalina Island on September 3, 1977 by Ed Martin of Santa Ana. The marlin, weighing 145 lbs., was recaptured by Nesbitt fishing from the Sea Horse, 5 miles off Laguna Beach.

The first broadbill swordfish tagged off southern California as part of a new cooperative tagging program between fishermen and the National Marine Fisheries Service was recovered by John Callison, a San Diego commercial fisherman on August 31. The swordfish was harpoon-tagged 16 miles east of the southeast end of Catalina Island on August 21, 1978 by Bill Hadley of Newport Beach, California and recovered about 15 miles southwest of Oceanside, California. During the 10 days that the fish was at liberty it moved southeast about 28 miles.

Much of the available information on the migration and habits of marlin and sailfish has been obtained from fish tags applied by cooperating sportfishermen. Now, scientists in the new National Marine Fisheries Service cooperative tagging program for swordfish are asking for help from fishermen to harpoon tag swordfish. The objective is to determine the migration patterns and rates of migration for these fish.

TIBURON LABORATORY

FISH COMMUNITIES INVESTIGATION

Grazing by Amphipod May Affect Habitat

Nearshore habitats are dominated by benthic algae, and variations in those algae strongly influence variations in the many organisms, including fishes, that live there. The perennial brown alga Laminaria dentigera is the dominant form in certain habitats, and may be greatly affected by the boring gammaridean amphipod Ampithoe lindbergi. Studies of this heretofore unrecognized relationship by Fishery Biologist Tony Chess at the Center's Tiburon Laboratory have shown that, by boring into the plant's stipe, the amphipod may inhibit frond development and eventually kill the plant. Because over 80% of the plants in certain areas are infested, the impact of this relationship could be substantial throughout the habitat.

Seasonal Depletion of Prey Resources Monitored

The vast numbers of benthic amphipods (mostly Metacaprella kennerleyi, Jassa falcata, and Microjassa claustris)--noted earlier to be major prey of nearshore fishes during the summer upwelling season, and reported last month to be declining sharply--were found to be absent this month by Chess. Oceanic waters have prevailed inshore this month, as demonstrated

by the higher water temperatures, greater water clarity, and composition of the plankton. It is suspected that the decline of these amphipods may relate to the changing oceanographic conditions.

"Wild Kingdom" Film Completed

The episode of the Wild Kingdom television series depicting studies of Tiburon's Fish Communities' Task on tropical reefs was completed this month. Dr. Edmund Hobson, Investigation leader at Tiburon, spent four days in Chicago assisting the production staff in final editing and writing the narration. The show will be aired nation-wide between late January and early March (the date varies in different locations).

Work Continues on Groundfish Management Plan

The Groundfish Management Plan Development Team of the Pacific Fishery Management Council met at the Tiburon Fisheries Laboratory, October 25-27 to revise the draft of the plan for resubmission to the Council in December. At the meeting, Dr. Lenarz presented his findings on the hake fishery. He pointed out that two major problem areas needed investigating so that a more comprehensive management plan could be developed for hake.

The first issue centers about the migratory behavior of hake. This behavior results in hake becoming available to fishing off California at a younger age than off Oregon and Washington. An approximate simulation of this behavior showed that a heavy fishery off California could have a serious impact on fishing to the north.

The second problem area is caused by large fluctuations in year class strength. To date, formal management strategies that vary allowable catch with changes in biomass have not been investigated. Such strategies would probably result in higher yields than a strategy that provides for a constant harvest at a relatively low but "safe" level.

Lenarz recommended a simulation approach that he believed would be fruitful for examining the two problem areas. A contract has been let by the NWAFC to Oregon State University to investigate hake management through simulation studies; Lenarz is preparing detailed suggestions for the work.

FISHERIES DEVELOPMENT INVESTIGATION

Fishing Begins on Rock Crab and Shortbelly Rockfish

A fishery for rock crab (*Cancer antennarius*, *C. productus*, and *C. anthonyi*) has been initiated at Point Reyes with the aid of the Tiburon Laboratory. Experimental fishing conducted by Laboratory personnel and a commercial fisherman showed that commercial quantities of rock crab

were available, and test marketing quickly disclosed that a demand existed for them. The fisherman has now obtained a permit from the California Fish and Game Commission granting him the special permission that is necessary for catching rock crab commercially, and fishing has commenced.

Preliminary experiments conducted at the Tiburon Laboratory showed that conventional Dungeness crab pots may not be suitable for rock crab because crabs as large as 112 mm carapace width can readily escape through the mesh. Legal minimum size is 102 mm. Other tank experiments indicated that both top-opening and side entrance funnels are effective in capturing and retaining rock crab. Top opening traps appear to be less effective in catching crabs, but they may allow easier escapement of Dungeness crab.

Scientists at the Tiburon Laboratory will monitor the progress of the fishing, and conduct further experiments on trap design to optimize catch while allowing escapement of small crabs and Dungeness crabs.

Preparations are being made for the first commercial attempt to catch and market shortbelly rockfish (Sebastes jordani). A cooperating fisherman is modifying two vessels for pair-trawling, and researchers have ordered the trawl, a 220-foot headrope Polish rope trawl, from a net-maker. Markets are available for varied product forms, quantities, and prices. The first fishing trip should occur in December.

Mature Salmon Return to
Pen-Rearing Site

Thirteen mature silver salmon were recaptured in the gill net this month brining the season total to 29. None of these returns were tagged, even though two-thirds of the released fish last year were Carlin-tagged. The experimental freeze brands have also not been observed on returning fish.

All of the nose-tagged king salmon, totalling 19,625 fish, were released. Average size was five per pound. Carlin-tagging of the remaining fish was begun at month's end. Of about 9,000 fish, 5,000 will be tagged.

PHYSIOLOGY INVESTIGATION

Bioenergetics of Striped Bass Development Analysed

Only minor laboratory analyses are needed to complete the outline of bioenergetic processes of early life stages of striped bass. Data were collected from three years of laboratory experiments. The study first determined the quantitative and qualitative variability of the endogenous energy sources of newly fertilized eggs. The sequences, rates, and efficiencies of utilization of the sources were measured and compared to estimates of metabolism obtained from oxygen consumption data. The transition from exogenous to endogenous energy sources is gradual and depends on the amount of food available. Under conditions of different live food densities, the daily energy consumption of feeding larvae was estimated and related to survival, growth, and differentiation. Work is proceeding on presenting these data in the form of energy budgets. California Department of Fish and Game has data which will allow comparison of these results with those from wild larvae and testing of hypotheses on which factors most influence survival and development of striped bass from fertilization to metamorphosis.

SEMINARS

La Jolla Laboratory

October 16 - Dr. Norman W. Bartoo spoke on "Changes in yield per recruit of Atlantic yellowfin tuna under the ICCAT minimum size regulations."

Hispanic Heritage Celebration

During October, the La Jolla Laboratory held a Hispanic Heritage Celebration as part of the NOAA program of Awareness Weeks. The Celebration, which was organized by Dr. Angeles Alvarino de Leira and Henry Orr, featured two seminars. On October 18, Dr. Iris Engstrand, Chairperson of the History Department at the University of San Diego, presented a lecture entitled "The Royal Scientific Expeditions to New Spain, 1785-1800." On October 26, Dr. Cruz Salvadores, Professor of Hispanic Civilization at UCLA, presented a lecture entitled, "Hispanic Civilization."

TRAINING

October 29 - November 3 - Maureen Woods, Librarian at the Tiburon Laboratory, attended a Federal Interagency Field Librarian Workshop in Washington, D.C.

HONORS AND AWARDS

Honolulu Laboratory

Dr. Robert Skillman received a Special Achievement Award on October 10.

La Jolla Laboratory

At its October meeting in Los Angeles, the Pacific Fishery Management Council reappointed Director Izadore Barrett for an additional two-year term to the Scientific and Statistical Committee. The Council also formally cited Barrett for his past work with the Council.

PUBLIC RELATIONS

Honolulu Laboratory

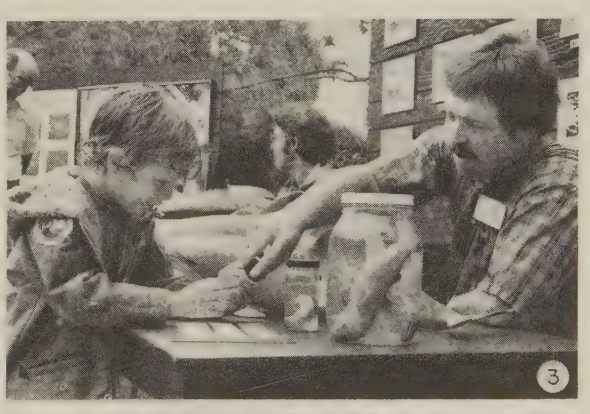
Heeny Yuen, Fishery Biologist, spoke to a recreational fishing class in the University of Hawaii College of Continuing Education on October 25.

La Jolla Laboratory

La Jolla Laboratory Holds Open House

The Southwest Fisheries Center's La Jolla Laboratory celebrated the 8th anniversary of the creation of the National Oceanic and Atmospheric Administration with an open house on October 20 and 21.

1) The outdoor exhibit, which included 12 displays, drew over 1000 people during the two-day event.
2) The National Weather Service joined SWFC in the open house with an exhibit of maps, photos, weather balloons, and weather recording instruments.
3) A young visitor to the open house is intrigued by the marine mammal display.
4) The National Ocean Survey displayed an Isaacs-Kidd midwater trawl and preserved samples of the organisms that the trawl collects.



The Southwest Fisheries Center/NOAA Open House attracted many distinguished visitors, including U.S. Congressman Bob Wilson, city councilman Larry Stirling, and representatives from the offices of Senator Hayakawa, State Assemblyman Jim Ellis, and State Senator Bob Wilson.

1) SWFC Deputy Director John Carr (left) points out a school of jack mackerel to U.S. Congressman Bob Wilson (right).

2) Mark Strauss (left) from State Senator Bob Wilson's office examines a tagging pole while Dr. Eric Barham, Fishery Biologist, (right) explains the SWFC billfish tagging program.

3) U.S. Congressman Bob Wilson (right) looks at photos of porpoise saving devices in a display constructed by the Porpoise-Observer Program, a unit of the Southwest Regional Office of the NMFS.

4) Dr. Roger Revelle, director emeritus of Scripps Institution of Oceanography, and his wife visited the Center for the Open House.

5) Dr. Carl Hubbs (center), world-renowed ichthyologist from Scripps Institution of Oceanography, attended the Open House. Dr. Hubbs was later joined by his wife and daughter and given a personal tour of the Center by Dr. Eric Barham.

1

2

3

4

5

MEETINGS AND TRAVEL

September 24-26 - Dr. W. Fox, leader of the La Jolla Laboratory's Oceanic Fisheries Resources Division, traveled to Miami, Florida to participate in pre-ICCAT Advisory Committee Meeting to formulate U.S. positions on Atlantic tunas prior to Advisory Committee Meeting.

25 - F. Kellenberger of La Jolla Laboratory traveled to Long Beach to meet with CF&G personnel on data processing systems, including obtaining party boat data.

25-27 - Dr. M. Laurs, leader of La Jolla Laboratory's Albacore Fisheries Program, traveled to Denver, Colorado to attend Annual Workshop of NMFS Vessel Committee.

25-29 - Center Director I. Barrett traveled to San Francisco, Sacramento, Eureka and Terminal Island to meet and accompany Terry Leitzell and Richard Frank.

October 1-7 - D. Holts and J. Coe of La Jolla Laboratory traveled to Seattle, Washington to attend a NOAA Advanced Scuba Diving Class.

2 - D. Mackett at La Jolla Laboratory traveled to Terminal Island to discuss Region/Center plans and operations.

- State-Federal meeting held in La Jolla to being work on Pacific bonito. A. MacCall, Dr. Huppert, Dr. Stauffer and R. Rinaldo of the La Jolla Laboratory and Collins and Radovich of CF&G attended.

3 - Richard Shomura, Director of the Honolulu Laboratory, attended the blessing ceremony of the vessel Keola at Pier 16.

- Shomura, Drs. M. Adams and R. Skillman, and H. Yuen attended a meeting to discuss marine recreational fishing with David Deuel of Washington, D.C., D. Gates, W. Van Campen (WPRFMC), and H. Sakuda (Hawaii Division of Fish and Game).

- Mickey Eldridge of Tiburon Laboratory visited Dr. S. I. Doroshov of the University of California, Davis, to discuss research results from the last experimental season.

October 3-15 - Kathy Link of PEG traveled to Honolulu, Hawaii to train ship's crew in operation of new XBT data digitizer and data logger.

3-5 - Fox and Dr. G. Sakagawa, Leader of the La Jolla Laboratory's Tuna Resources Program, traveled to Washington, D.C. to participate in a meeting with U.S. Advisory Committee to ICCAT.

4 - T. Jackson of La Jolla Laboratory traveled to Sacramento, Truckee and Reno to inspect PBY Innovator and to discuss bow and internal modifications of aircraft for 1979 survey.

4-6 - K. Bliss, L. Eber, R. Evans, R. Lasker, M. Laurs, R. Lynn, and M. Sullivan of La Jolla Laboratory traveled to Lake Arrowhead, California to attend the 25th Eastern Pacific Oceanographic Conference.

4-8 - Stauffer traveled to Seattle to attend a population dynamics workshop on hake.

5 - Ed Ueber of Tiburon Laboratory attended the Optimum Yield Workshop, Seattle, Washington.

6 - I. Barrett and Deputy Director J. Carr traveled to Terminal Island to discuss Region/Center plans and operations.

6 - Kellenberger traveled to Monterey, California to attend a meeting with PRI and PEG to discuss the processing of party boat data.

10 - The NWHI orientation cruise meeting was held in the conference room at the Honolulu Laboratory. Shomura attended portions of the meeting.

10-11 - Sakagawa and J. Squire of La Jolla Laboratory traveled to Long Beach and Los Angeles to attend a Billfish Management Planning Team meeting and to present a progress report to the Pacific Fishery Management Council.

10-13 - Dr. Bill Lenarz and Ueber of Tiburon Laboratory attended the PMFC and Groundfish Planning Team Meetings, Los Angeles, California.

11 - Shomura attended a meeting at the Grand Pacific Life Insurance Co., Ltd. office to discuss Council matters with Wadsworth Yee, Chairman, WPRFMC, and Van Campen.

October 11-12 - P. Smith, L. Eber and J. Zweifel of La Jolla Laboratory traveled to Monterey, California to discuss climatic analysis of California Current resources.

11-31 - Dr. D. Huppert of La Jolla Laboratory traveled to Los Angeles to attend the SSC meeting of the Pacific Fishery Management Council.

- Laurs traveled to Monterey, California to install equipment and brief crew on tagging and ocean observations on several albacore jig boats on charter to AFRF working cooperatively with NMFS.

11-15 - R. Nishimoto of La Jolla Laboratory traveled to Morro Bay, California, Moss Landing, California, Bodega, California and Oakland, California to install equipment and to brief crews on tagging and ocean observations on several albacore jig boats on charter to AFRF working cooperatively with NMFS.

12 - Shomura attended a ceremony for the signing of a 1-year trial agreement by the State of Hawaii and the U.S. Navy to enable local fishing boats to refuel and unload fish at Midway. The ceremony was held at the Governor's office.

12-15 - Kellenberger traveled to Honolulu to meet with Honolulu Laboratory personnel on planning data management activities.

12-16 - T. Shay of La Jolla Laboratory traveled to Honolulu to monitor tagged porpoise.

13 - Shomura, Van Campen, and WPRFMC members met in the conference room to review research activities of the Honolulu Laboratory.

15-19 - Fox traveled to St. Petersburg, Florida to attend a joint meeting of Gulf States and Atlantic States Marine Fishery Commissions.

16-17 - Kellenberger traveled to Coeur d'Alene, Idaho to attend PMFC Goals and Guidelines Data Committee Meeting.

17 - Shomura called a meeting of Honolulu Laboratory staff members (H. Yoshida, M. Adams, R. Mendelssohn) and WPPO members (D. Gates, J. Naughton) to discuss environmental impact statement matters as they related to the proposed South Pacific Fisheries Agency.

October 17 - Shomura, as Chairman of the Billfish Planning Team, called a meeting of the planning team in the Honolulu Laboratory conference to discuss the status of the billfish FMP.

18 - Shomura attended a luncheon meeting of the Leeward Community College Marine Technology Advisory Committee. Agenda items were (1) validation of Marine Technology Program, (2) modification of existing courses and development of new courses, (3) employment prospects for graduates of the Marine Technology Program; job referrals, and (4) direction that training should take to be consistent with job markets.

- State-Federal meeting on bonito was held in La Jolla. Collins, Radovich, Huppert and Stauffer attended.

20 - Dr. W. Perrin and W. Stuntz of La Jolla Laboratory traveled to Santa Cruz, California to confer with Dr. Ken Norris on porpoise behavior studies.

- Shomura attended a meeting of the Lobster Planning Team called by Dr. Tim Smith, Chairman.

20-31 - D. Bratten of the La Jolla Laboratory traveled to Ponce, Puerto Rico to supervise the installation of super aprons on U.S. purse seiners returning from the African tuna fishery.

22-27 - Shomura departed Honolulu for Kailua-Kona to attend the Western Pacific Council meeting (10/23-24) and the Council Chairmen's meeting (10/24-25). He returned to Honolulu on Wednesday (10/25) and spent a half day with Dr. George S. Benton, NOAA, Washington, D.C. (Dr. Benton was in Honolulu to attend the National Weather Service's Regional Director's meeting). Shomura left again for Kailua-Kona Wednesday evening to attend the MAFAC meetings (10/26-27) and returned to Honolulu Friday evening (10/27).

25-27 - Lenarz and Ueber attended the Groundfish Planning Team meeting, Tiburon Fisheries Laboratory.

October 26 - November 4 - S. Covey of the La Jolla Laboratory traveled to Washington, D.C. to attend the Federal Interagency Field Librarians' Workshop.

October 29 - November 4 - Perrin traveled to Washington, D.C. to attend the course "Commerce Personnel Management for Supervisors."

October 30 - November 2 - I. Barrett, D. Mackett, E. Ahlstrom, E. Barham, J. Butler, S. D'Vincent, L. Eber, B. Flerx, R. Hewitt, J. Hunter, R. Lasker, R. Leong, R. Lynn, B. MacCall, J. MacGregor, D. McConaghy, J. Metoyer, G. Moser, C. O'Connell, R. Owen, P. Paloma, K. Parker, C. Sanchez, E. Sandknop, P. Smith, G. Stauffer, B. Stevens, J. Thrailkill, R. Charter, D. Roll and G. Theilacker--all from the La Jolla Laboratory--traveled to Idyllwild, California to attend the CalCOFI Conference. A. Bakun of PEG also attended.

October 30 - At the Honolulu Laboratory, Hawaii Area Laboratory Employees Association (HALEA) aloha coffee hours was held for departing tenants, the staff of ITIC who occupied Room 218 since October 1973. They will be moving into the Federal Building.

October 30 - November 1 - Fox traveled to Charleston, S.C. to attend the dedication ceremonies for the new Charleston Laboratory.

- Laurs and Evans traveled to Pasadena, California to attend a special meeting on the use of the oceanographic data acquired from SEASAT A.

October 30 - November 2 - Coe traveled to Las Vegas, Nevada to attend the CSC class "Personnel Management for EEO Staffs."

October 30 - November 3 - Gunter R. Seckel of PEG traveled to Miami, Florida to attend the Climate Diagnostic Workshop.

October 31 - November 3 - Squire traveled to Honolulu to attend a meeting to discuss the Pacific Billfish Preliminary Management Plan.

October 31 - Shomura attended a luncheon-meeting at the Oceanic Institute (OI) at Makapuu Point. He was one of 25 invited to become acquainted with OI's activities.

VISITORS

Honolulu Laboratory

October 2 - R. Adm. Eugene A. Taylor, Director, Pacific Marine Center, NOS, Seattle, met briefly with Mr. Shomura.

3 - Mr. Shomura and Mr. Doyle Gates, Western Pacific Program Office (WPPO), met with Dr. William Ripley of UNDP, New York.

October 10 - Mr. Iso Tanaka, Executive Managing Director, Koden Electronics Co., Ltd., visited Mr. Heeny Yuen to introduce a depth sounder with echo presentation in color, coded according to echo strength.

11-13 - Mr. Fred Kellenber, SWFC, was at Honolulu Laboratory to review Honolulu Laboratory's ADP activities with Mr. George Liao.

12 - Mr. Lapasend Mili of Papua New Guinea, escorted by Mr. Kendall Ellingwood of the local U.S. State Department Reception Center, met briefly with Mr. Otsu.

16 - Mr. John C. Marr, Director General, International Center for Living Aquatic Resources Management, Manila.

19 - Ms. Florence Sablan, Marine Resources, Saipan and Ms. Rhonda Fleming, Saipan.

26 - Mr. Ralph Reeder, NOAA Personnel Chief, visited Honolulu Laboratory and spoke to nearly the entire staff including WPPO and International Tsunami Information Center on the topic "Civil Service Reforms." His engaging morning talk was topped off by a question-and-answer period before he returned to the afternoon session of the National Weather Service Regional Directors' Conference in the Federal Building.

31 - Mr. Shomura spent some time with Brian and Patti Johnson to discuss monk seals.

La Jolla Laboratory

October 3 - Gene Nitta, NMFS, Terminal Island.

10 - John Goodman, Fisherman.

- James Becker, Xerox.

11 - Robin Le Brasseur of Environment Canada met with Dr. Paul Smith.

October 12 - A delegation from Norway's Fisheries Councils met with Lasker, Smith, Stauffer, MacCall, and Huppert and discussed extended jurisdiction. The members of the Norwegian delegation were: Messrs. Egger, University of Oslo; Farstad, an economist; Dragesund, University of Bergen; Sundnes, University of Trondheim; and Heen, of the Norwegian Fishery Council.

12 - John A. Dmokowski, USC/HEP/MCS, Biology Department, USC.

- Jack T. Andrews, SWR, Terminal Island.

17 - Judy Mammo, IBM.

18 - John Ventura, Office of Senatory Hayakawa.

24 - Joe Mueller, Regional Economist for the NE Region, visited the SWFC, conferred with Huppert, McMillan and King on general economics matters in NMFS, and consulted more extensively about his multispecies model of the Northeast Atlantic groundfisheries.

26 - Bryan Weare and Ted Strub, UC Davis.

27 - Dr. H.C. Johnson, Veterinarian, Claremont, California.

Tiburon Laboratory

October 3 - Jo Ann Chandler, Sanctuary Programs Office, NOAA, Washington, D.C.

- Fran and Bill Jones, Hemet, California.

- Kristina Ewbank, Sonoma, California.

10 - Dr. Michael Rozengurt, San Francisco, California.

12 - Mike Hearne, San Francisco State University, San Francisco, California.

- Rune Swedburg, Swedo Pump Company, San Francisco, California.

13 - R.J. Cardt, Regional Water Quality Control Board, San Francisco, California.

October 17 - Rune Swedburg, Swedo Pump Company, San Francisco, California.

18 - Thomas P. Scott, San Rafael, California.

- Marc Flax, Belvedere, California.

20 - John Snellgrove, San Francisco State University, San Francisco, California.

25 - Al Millikan, Washington Department of Fish, Seattle, Washington.

- Tom Dark, NMFS/NWAFC, Seattle, Washington.

- Coleen Alkarz, Marin Sherriff's Department.

26 - Don Gunderson, University of Washington, Seattle, WA.

- Tom Jow, California Department of Fish and Game, Menlo Park, California.

- Chuck Knutson, Department of Fish and Game, Sacramento, California.

- Marcus Sazaki, Department of Fish and Game, Sacramento, California.

27 - Robert N. Smith, Mill Valley, California.

Pacific Environmental Group

October 5 - Stephen B. Reilly, NWAFC/Marine Mammal, Seattle, WA.

11 - M. Laurs, P. Smith, J. Zweifel, and L. Eber, SWFC, La Jolla, California.

- Dr. R. LaBrasseur, Fisheries Research Board of Canada, Nanaimo, B.C. Canada.

18 - Robin Allen, IATTC, San Diego, California.

PERSONNEL

October 1 - Barbara Watkins, Purchasing Agent, Career Conditional Appointment - La Jolla Laboratory.

- R. Nydam, Computer Technician, Temporary Appointment - La Jolla Laboratory.

October 1 - Roy R. Sasaki, Biological Technician (Microbiology), Temporary Appointment NTE 700 hours - Honolulu Laboratory.

- Jose Enitan, Biological Aid (Microbiology), TAPER Appointment - Honolulu Laboratory.

2 - Valerie Spowart, Cash and Attendance Clerk, Permanent Part-Time - La Jolla Laboratory.

8 - Michael Bowers, Biological Technician, Career Conditional Part-Time - Tiburon Laboratory.

- Ken Wallace, Biological Technician (Fisheries), Promotion - La Jolla Laboratory.

- Bill Flerx, Biological Technician, Promotion - La Jolla Laboratory.

- Kathy Senini, Data Transcriber, Career Conditional Appointment Part-Time - La Jolla Laboratory.

10 - Nancy Stapp, Student Trainee (Fisheries), Co-op Appointment - Tiburon Appointment.

- Cindy Haight, Student Biological Aid, Temporary Appointment - La Jolla Laboratory.

- Evelyn Portillo, Scientific Illustrator, Temporary Appointment - La Jolla Laboratory.

16 - Delores M. Fussy, Clerk-Stenographer, Appointment - Tiburon Laboratory.

- Andrew Axelrod, Student Computer Aid, Temporary Appointment - La Jolla Laboratory.

- Raul Freitas, Student Computer Aid, Temporary Appointment - La Jolla Laboratory.

17 - Linda L. Hudgins, Economist, Conversion to 1040-h Appointment - Honolulu Laboratory.

19 - Julia Dickson, Clerk-Stenographer, Name Change to Shoemaker - La Jolla Laboratory.

20 - Eugene Burke, Janitor, Retirement - Tiburon Laboratory.

- Marta Dik, Biological Aid (Fisheries), Resignation - La Jolla Laboratory.

October 22 - Melva Hobbs, Secretary (typing), Career Conditional Appointment - La Jolla Laboratory.

23 - Cathy L. McNamara, Data Transcriber, Temporary Appointment NTE 1 year - Honolulu Laboratory.

26 - Jeffrey J. Polovina, Statistician, Temporary 1-month Appointment - Honolulu Laboratory.

31 - Debra P.L. Chow, Computer Programmer, Part-Time Intermittent, Resignation - Honolulu Laboratory.

UNITED STATES
DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE
SOUTHWEST FISHERIES CENTER
8604 LA JOLLA SHORES DRIVE
P.O. BOX 271
LA JOLLA, CALIFORNIA 92038

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE, $300

AN EQUAL OPPORTUNITY EMPLOYER

POSTAGE AND FEES PAID
DEPARTMENT OF COMMERCE
210

THIRD CLASS